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such a stem the rattle is distinct, the separate clicks being as loud as those made by slowly winding a watch. After the first series of clicks the plant must rest some time before a second disturbance will produce a second fusillade.

D. S. KELLICOTT.

Buffalo, N. Y.

Bees mutilating flowers.

The note on bees mutilating flowers, in "Open Letters," was interesting to me, having been interested in the same subject myself. I believe it is considered safe to plant two colors of balsams (*Impatiens balsamina*) in adjacent rows without their mixing. Not being satisfied to take it for granted, I sought the reason. Upon examination I found the anthers were closely pressed to the stigma, thus insuring self-fertilization without any outside help. Also, as the flower became double, the opening to the spur was entirely closed by petals. Humble-bees, in seeking for honey, were obliged to visit the "back" of the flower and puncture the spur. I never saw one visit the inside of the flower nor puncture a spur that had been visited before, though it did not seem to learn that fact until it visited each flower.

Humble-bees, in getting the honey from *Salvia splendens*, enter the calyx and slit the corolla. This is a very interesting subject, and any one observing anything bearing on the subject would do well to make notes and send them for publication.

E. S. MILLER.

Wading River, N. Y.

CURRENT LITERATURE.

Fossile Pflanzen aus der Albourskette, von Dr. A. Schenk. Bibliotheca Botanica, Heft 6, 4to, pp. 14; pl. ix. Cassel: Theodor Fischer, 1887.

The Albourskette, the locality from which the fossil plants herein described were obtained, is a mountain chain on the southern and western sides of the Caspian sea in Northern Persia. It is a locality difficult of access, and consequently has been rarely visited by collectors of fossil plants. The first to explore these plant deposits was Dr. Göbel, of Asterabad, who submitted a small collection to Dr. H. R. Göppert for examination. From this material Dr. Göppert identified (*Schles. Gesell.*, 1860, p. 19, 20) six species, of which four were ferns and two were cycads. From the resemblance between these plants and those obtained in the vicinity of Bureuth, and also from geological considerations, Dr. Göppert concluded these plant-bearing beds to be of Liassic age. Later Eichwald collected from the same locality the species mentioned by Göppert, as well as several additional ones, and ventured the opinion that the strata showed oölitic as well as liassic characters. The material placed at the disposal of Dr. Schenk was collected chiefly by Herr Tietze, from the vicinity of Hif, near Kaswin; from Tasch, which is between Sahachrud and Asterabad; and from Mt. Siodshur, near Ah. This material was much

more copious than any that had previously been examined, and from it he was able to identify 28 species, of which number 4 proved to be new to science. No dicotyledons are of course represented, the species being distributed among the various divisions as follows: *Equisetaceæ*, 2; *Filices*, 8; *Cycadaceæ*, 12; *Coniferæ*, 6. The most valuable part of the paper is the interesting comparison made between this flora and that of Franconia, Scandinavia, and Tong-King, India. Of the 28 species found in the vicinity of Hif and Tasch only 7 are peculiar. Of this number 10 are found in Franconia, 12 in Scandinavia, and 6 in Tong King. This shows that the flora of these localities, widely separated as they are geographically, was nearly or quite synchronous, another argument pointing to the wide geographical distribution of the early floras. The American plant-beds which furnish a flora most nearly related to that of the famous Franconian beds are the older mesozoic of Virginia and the so-called triassic of Emmons, in North Carolina. From these considerations Dr. Schenk decides the age of these beds to be rhetic, placing them lower, it will be seen, than any of the previous investigators. The abundance of ferns and cycads argues for this flora a tropical temperature. Each species is carefully described and discussed, and in most cases fully illustrated.—F. H. KNOWLTON.

Sylloge Fungorum omnium hucusque cognitorum. Digessit P. A. Saccardo. Vol. v; Agaricineæ. Patavii, sumptibus auctoris; 1887. 8°. pp. 1146.

The fifth volume of Prof. Saccardo's great work, *Sylloge Fungorum*, will be gladly welcomed by all students of the department of mycology to which it pertains. Though devoted to a single family, Agaricineæ, it is the most voluminous one of the series yet issued. Its 1146 pages contain descriptions of 69 genera and 4639 species. The original design of the work, as the author remarks in the preface, being to collect and systematically arrange published descriptions, no attempt has been made to elucidate synonymy or to suppress invalid species. Here is a vast and difficult work for some one yet to undertake. It is gratifying to note that the spore characters have been so generally introduced with the descriptions. While the main features of the Friesian system of arrangement have been followed, some notable changes have been made.

The sections of the family are still based on spore coloration, but in an amplified sense. The section *Leucosporæ* has been made to include *Hygrophorus*, *Lactarius*, *Russula*, etc.; also, such genera of tough marcescent species as *Marasmius*, *Lenzites*, *Lentinus*, etc., though these are still retained in a subsection *Tenaces*. The third section, *Ochrosporæ*, equals *Dermini* of Fries with *Cortinarius* and *Paxillus* added; and the fourth, *Melanosporæ*, includes the Friesian *Pratelli* and *Coprinarii* with *Coprinus* and *Bolbitis*, thus reducing by one the old sections.

The subgenera of the vast genus *Agaricus* have been raised to the

rank of genera, and *Agaricus* includes only those species formerly placed in the subgenus *Psalliota*. Whatever may be said of the characters on which these genera are founded, this arrangement is certainly more convenient.

The exannulate species of *Amanita*, corresponding to section B of Fries, constitute the genus *Amanitopsis*, and in like manner the annulate species of *Panæolus* become a genus *Anellaria*. The same distinction, however, has not yet been accorded to the annulate and volvate species of *Coprinus*, though logically it would seem to be required.

Of course, there are a few omissions, but these can easily be excused in a work so vast. Students of this branch of mycology will find the volume a most useful, convenient, and even indispensable one, and will be very grateful to Prof. Saccardo for giving them such a vast amount of solid mycological literature in such a compact, systematic form, at the comparatively low price of 72 francs.—CHAS. H. PECK.

A Course of Practical Instruction in Botany: Part II, Bryophyta-Thallophyta.

By F. O. Bower, D. Sc., F. L. S., and Sydney H. Vines, D. Sc., F. R. S., F. L. S. Macmillan & Co.: London, 1887. 12°, pp. 144.

The first part of this work, embracing the flowering plants and vascular cryptogams, was issued over two years ago, and noticed in this journal for May, 1885. The present part, entirely from the pen of Dr. Bowers, as we learn from the preface, completes the work with the same admirable features displayed in the first part. It is unnecessary to repeat here the general comments and criticisms made upon Part I in the earlier review, as they hold equally good for all portions of the completed work.

For mosses and liverworts under *Bryophyta* three types are used, *Polytrichum*, *Sphagnum* and *Marchantia*. The *Thallophyta* are divided into *algæ* and *fungi*. Sixteen types are used for the *algæ*, of which the first three are salt water forms representing the red and olive-green seaweeds, and the others are fresh water forms, the number permitting quite a range of well selected types. The *fungi* are illustrated with ten types, beginning with the common mushroom, *Agaricus campestris*, and continuing with the wheat rust, *Puccinia graminis* in its various stages, the cup fungus, *Peziza*, a lichen, *Parmelia parietina*, ergot, several molds, the white rust on *Capsella*, and *Pythium DeBaryanum*.

The selection is to be commended, and the treatment also, with some slight reservations. This stricture refers chiefly to the occasional lack of sufficiently explicit directions, in order that the learner may not go astray or become hopelessly lost in demonstrating difficult points of structure, or in attempting to find the more obscure parts referred to. Much is left to the ingenuity of the pupil, or the help to be obtained from a master.

For advanced pupils, especially those under good supervision, the work will prove most serviceable. The directions for studying the life-

cycle of the lower forms, in the cases where it can be done to advantage, is a valuable feature.

Comparative Morphology and Biology of the Fungi, Mycetozoa and Bacteria.

By A. DeBary. Translated by Henry E. F. Garnsey, M. A.; revised by Isaac Bayley Balfour, M. A., M. D., F. R. S. Clarendon Press, Oxford, 1887. Roy. 8°, pp. 525; 198 wood-cuts.

A faithful and adequate translation of this invaluable work on fungi and fungoid plants places the important facts pertaining to their physiology, structure and classification within easy reach of every English botanist. A feature that characterizes the work above all others on the subject is the broad and philosophical treatment, giving not only a connected view of the whole field, but a systematic arrangement of the subject matter based upon ample knowledge and sound deductive reasoning.

The title indicates the scope of the work, the lichens being included with fungi. The course of treatment for the fungi is as follows: general histological characteristics of hyphæ and growth forms; forms of the mycelium; formation and dissemination of spores; systematic and comparative account of the several groups, the principal ones being Peronosporæ, Saprolegniæ, Mucorini, Entomophthoræ, Chytridiæ, Ustilaginæ, Ascomycetes, Uredinæ and Basidiomycetes, covering over 200 pages; spores and their germination; conditions of growth; and parasitism, including that of lichens. The mycetozoa comprise the myxomycetes, the Acrasiæ and some doubtful forms, which severally receive general treatment. The chapter on bacteria is an admirable summary of the chief facts and relations of their morphology and physiology.

It is needless to go over the contents of the work more specifically, for the limits of a review, even when extended, can give but an imperfect idea of the wealth of matter in so large and carefully prepared a treatise, and the opinion of the reviewer regarding its superior merits must be accepted without argumentative accompaniment.

In its German dress the work is already known to many of our advanced students of fungi, as it was issued about three years ago, being reviewed in this journal for December, 1884. The translators have not attempted to bridge the interval with notes or later discoveries which affect the text. Thus, on page 337, the statement that the germinating sporidia from the teleutospores of *Puccinia graminis* penetrate into the epidermal cells of the barberry, but "never into a grass," is shown by the researches of Plowright not to be unqualifiedly true. However, in spite of the mutations due to extension of knowledge, the work will be standard for many years to come.

Ueber die Bildung der Knollen. Physiologische Untersuchungen von Hermann Vöchting. (Bibliotheca Botanica, Heft 4.) Theodor Fischer: Cassel, 1887. 4°, pp. 55. Illustrated.

This memoir forms the fourth number of the *Bibliotheca Botanica*, under the editorship of Drs. Uhlworm and Hænlein. It deals with an

investigation into the action of light, moisture and gravitation upon the production of tubers, especially those of the potato; or, as the author has concisely stated it in the first sentence of the introductory chapter, "The subject treated in the following pages is the problem, what causes determine the position and growth of tubers." The potato was used for most of the experiments, being especially well adapted for the purpose. Besides the potato, *Helianthus tuberosus* and *Ullucus tuberosa*, the latter a South American esculent, were studied as examples of annual tubers, and two species of *Begonia* for perennial tubers. The author refers to de Vries' memoir (*Landw. Jahrbücher* for 1878) for a critical review of most of the literature pertaining to the subject.

The variety of potato chiefly used for the experiments is one not commonly grown in this country; it is known in Germany as the "six-weeks potato," in France as "marjolin," and its peculiarity consists in usually producing a thick leafless growth at one end during the period of rest, being the expansion of the terminal bud.

By many ingenious experiments it was established that light exerted a retarding influence upon the growth of the tuber, and that a certain range of temperature was also desirable. Tubers may occasionally be produced above ground in the light, as is known not only from casual observation but as proven by earlier investigators. The author showed from his own experiments that the potato stem is verticibasal; that at its base it normally produces, besides the roots, the tubers, and at the apex the foliage. When a plant is grown from a reversed cutting, the tubers are produced upon the proper base of the stem, which is now above ground and in the light. Tubers can also be produced above ground by using a cutting which has only part of one internode sunken in the soil, so that no node is below the ground to give off subterranean stolons. Another method is to start the tuber, and when the roots around the base of the shoot are of some length, to remove the old tuber and leave the stem entirely above ground but with the roots in the soil. The base of the stem, which is now above ground, produces tubers. Tubers formed above ground are small, but it was found that if the light was excluded from such a tuber it grew to the usual size.

Space does not permit a further mention of experiments or even a full statement of the results. It must suffice to say that the author concludes that the position and the growth of the tuber and the deposition of starch in the same are separable processes; that gravitation has very little or nothing to do with determining the position of tubers, but that it depends for the most part upon internal causes; and that light has a strong retarding power on their development.

The work is an excellent example of physiological research carried on with inexpensive apparatus and without the employment of a microscope.